for use with:
The City of San Leandro’s
Residential Seismic Strengthening Plan
Standard Plan A
**Introduction**

This booklet is designed to provide information about specific elements for seismic retrofitting work that is contained in the Residential Seismic Strengthening Plan set “A”. This prescriptive plan is based on standards contained in Appendix A3 of the 2006 International Existing Building Code (with modifications for local conditions) and focuses on potential seismic weaknesses in the foundation, anchors and cripple wall construction of older homes.

This booklet is designed to assist you in performing the seismic strengthening work that is critical to your home’s survival in an earthquake. The intent is not to teach seismic retrofit design, but to teach implementation of the design developed in the plan.

**What does a retrofit look like?**

The retrofit in this plan consists of anchors installed through the mudsill into the foundation. Plywood nailed to the cripple wall studs connecting the mudsill to the top plates and framing clips to connect the top plate to the floor system above.
**Does my house qualify for Planset A?**

Planset A is what is known as a prescriptive plan, which means that it works for a specific type of building. If your house has any of the following elements then this plan does not apply:

- Buildings exceeding 2 stories in height
- Buildings with more than 2 dwelling units
- Buildings with clay tile or concrete tile roofing materials (some lightweight tiles may be acceptable)
- Buildings with lateral force resisting systems using poles or columns embedded in the ground (if any of your house is held up by a post or column)
- Buildings with brick or stone veneer which extends vertically more than 3 ½ feet above the foundation
- Buildings that are constructed slab on grade (do you have a cement floor?)
- Buildings that are built on a lot sloped enough that the foundation has to be stepped
- Buildings with conditions that are beyond the scope of the Plans prescriptive requirements (to be determined by the enforcement agency)
House Construction 101

In order to understand what this booklet covers, it will be helpful to know these construction terms

Typical Conventional Light Framing Side View
A partial list of framing parts defined

- **Mud sill**- the piece of wood, normally pressure treated lumber or redwood that comes into direct contact with the concrete foundation. The mudsill may or may not be attached to the foundation with bolts.
- **Anchor bolts**- threaded metal bolts either cast into place when the concrete is initially poured or installed after the fact by mechanical or chemical means.
- **Cripple Studs**- the vertical wooden framing members that extend from the mudsill to the bottom of the top plates.
- **Top Plates**- Horizontal framing members that sit on top of the cripple studs and support the floor joists.
- **Floor Joists**- These wood framing members extend from wall to wall to create the floor framing.
- **Rim Joist**- this framing member sits on top of and on the outside edge of the top plates to provide solid perimeter nailing for the flooring above and connection to the cripple wall below. If the framing member is not continuous and instead has pieces that fit between the floor joists then it is called **Rim Blocking**.
- **Cripple Wall**- the wood framing portion of the house that consists of the mudsill, the cripple studs and one or more top plates.
Why you should retro fit your house

The purpose of seismically retro fitting your house is to create a continuous “load path” for forces to travel. “Load Path” is the pathway seismic forces travel, through various framing elements of a structure. Plan set “A” concentrates on the connections from your first floor to the foundation. Each part or connection is vitally important; a missed connection could result in catastrophic results.

Building surveys conducted after the Northridge Earthquake indicated that damage was primarily the result of inadequate cripple wall bracing and lack of quality control in design, construction and inspection.

An earthquake is a sudden tremor or movement of the earth's crust, which originates naturally at or below the surface of the earth. Earthquakes cause movement of your home due to a force called inertia. Inertia is the tendency of a body to resist acceleration or of a body at rest (your house) to remain at rest. For example, inertia causes the driver of a car to be thrust backwards in his seat when he accelerates. The same is also true when the driver breaks suddenly; the driver’s body continues to move forward in an attempt to continue at the same speed it was travelling at.

During an earthquake, the ground moves from left to right and up and down. As your foundation moves with the ground it rests on, the upper portion of your home is actively attempting to catch up to it. Given enough movement, a house may detach from the foundation, the cripple wall may collapse and the gas line may rupture. For a relatively small investment, you can retrofit your house and potentially save thousands of dollars in the event of a major earthquake. You will be able to stay in your home and not be displaced because your house is deemed unsafe.

Other reasons why people retrofit are economical. Some insurance companies may require retrofitting to continue coverage. Also, if you sell your home there is real and perceived value in a home that meets these standards.

Purpose of this manual

Please take the time to read through this manual thoroughly before submitting your plan to your local building department for a permit

This manual is meant as a companion to the Plan Set A drawings. The drawings themselves are used as your design to submit to the building department and as your job site copy or blueprint. The manual includes subjects not addressed on the planset such as definitions, terms, hardware and unusual circumstances.

Most brands of hardware that has an approved listing may be used for this plan. If your building department does not have the specifications for the brand you choose you will be asked to supply the manufacturers data specification sheet at the time of your submittal.
Before getting started

The time has come to decide if this is a project that you want to do yourself or do you want to hire a contractor. You will want to consider if you have the time and the skill to do this type of work.

- Take a look underneath your house, how much room do you have to move around?
- Is the foundation and the under floor framing in good enough condition for you to go ahead with a retrofit or do you need to make repairs before you can start?
- Do you have the tools you will need to do the work? A list of tools needed to complete this project has been provided for you on page 39. Some cities such as Berkeley and Oakland have tool lending libraries; while in San Leandro, if you take the City sponsored course you are eligible to use their tools for free for this and future home remodels or repair.
GETTING STARTED

Now that you have made the decision to retro fit your house, it is time to start the actual work.

A. Creating a drawing

1. Start out with a rough outline of the shape of your house on a blank piece of regular paper.
2. Measure the outside of your house with a tape measure, round off to the nearest inch.
3. Go under the house and see where any interruptions in the walls are such as windows, chimneys, utility equipment and access doors.
4. Create a drawing on graph paper that is of the proper proportions or “to scale” (i.e. 1 inch = 1 foot)

B. Under floor Space Inspection

It is time to go back under the house and do a thorough inspection of the under floor space.

<table>
<thead>
<tr>
<th>YOU WILL NEED</th>
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<tbody>
<tr>
<td>• Work clothes</td>
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<tr>
<td>• Flashlight or any light source</td>
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<tr>
<td>• Camera (digital comes in handy here)</td>
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<tr>
<td>• Probing tool</td>
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<tr>
<td>• Screwdriver or an awl works well</td>
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<tr>
<td>• A copy of your drawing</td>
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<tr>
<td>• The “Home Seismic Checklist” from the end of this section. (page 26)</td>
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</tbody>
</table>

1. Make your way around the perimeter of the house checking the foundation for the condition of the concrete, a few jabs with your probing tool will tell you if the concrete is firm and intact or if it is powdery and decomposing. If you probe the foundation and sizable chunks pops off you may have “spalling”. Spalling is a result of water entering brick, concrete or natural stone and forcing the surface to peel, pop out or flake off. Eventually, spalling can cause crumbling and destruction of a foundation.

2. Probing the mudsill and cripple wall framing will help find any dry rot or termite damage. You may see some staining of the wood under your house, as long as the wood is intact and not brittle the stains are probably ok, you can ask the building inspector about it when he/she comes to inspect.

3. If you find that you are unsure about the conditions under your house you can either hire a licensed contractor to check it out or, after having obtained your permit, call for the building inspector to take a look.
4. While you are under the house take note of how your cripple wall is built. **Knowing these details now can save you a second trip under the house later.**

- Do you have a stem wall or a trapezoidal foundation?
- How tall is the cripple wall assembly? The height of the cripple wall will determine what type of anchoring system you can use. Measure from the top of the mudsill to the bottom of the top plate.
- Is the mudsill embedded in the foundation?
- Is your mudsill wider than the cripple studs? If so, you will have to install blocking.
- Do you have existing anchor bolts connecting the mudsill to the foundation? If so, how far apart are they?
- Note what direction your floor joists are running
5. At this point you should have completed the following activities:

- Drawn a scaled foundation plan of your house
- Identified pertinent construction information about your foundation system, cripple wall and floor systems using the “Home Seismic Checklist”
- Identify the direction of run of all the floor joists and beams on your scaled foundation plan
- Identify the location of all perimeter wall obstructions and openings on your scaled foundation plan

6. You are now ready to determine the specific methods to be used to strengthen your home against earthquake forces. First we are going to show you the techniques and later we will tell you how to apply them to your plan and your house. Throughout the next section we will be referring to the Planset A details so it will be helpful to have both pages of the plan nearby. The plan set is broken in to numbered sections on each page. These sections are called details and may have lettered subsections. You may for instance be told to look at 4B/S1 which would be detail 4 subsection B on page S1. Additionally there are technical notes on page S1 that provide specifications and requirements that are not included in the details. Be sure to read through the entire plan set.

C. Bolting the Mudsill to the Foundation

Each of your cripple walls may be constructed differently so it is important that you identify the specific method you need to apply to each area.

Previously we had you measure the height of your cripple wall; your measurement will tell you what type of anchoring system you can use. In order to install an anchor bolt into the mudsill you will need at least 24 inches to position the rotohammer and the epoxy dispensing gun (Exhibit C2, pg. 13) If you have space then you can plan on using anchor bolts, if you have less clearance then you will need to use a anchoring system that attaches to the side of the footing such as a universal foundation plate (UFP10). Because of its unique shape the UFP10 plate can be used even if the mudsill is set in from the edge of the foundation up to 2 ½ inches. Figure 2/S2 shows these two methods.
1. **Chemical anchoring versus Mechanical anchors**

There are (2) types of anchoring systems that are approved for this planset, chemical and mechanical.

(a) A **chemical anchor** uses a threaded steel rod inserted into a drilled hole which has previously been filled with an epoxy compound. The epoxy used typically comes in what looks like two caulking tubes stuck together and requires a special dispensing gun (Exhibit C2). The nozzle attached to the gun does the mixing automatically.

(b) A **mechanical anchor** (wedge anchor) is a steel rod with a threaded portion at the top and a smooth tapered section at the bottom surrounded by a sleeve that expands when you tighten the bolt after it is installed.

![Wedge anchor before and after expansion](image-url)
Both systems have advantages, the wedge anchor costs more per bolt than threaded rod but does not require epoxy, which can be difficult to work with. The drawback of a mechanical anchor is that due to the expansion of the sleeve a certain amount of pressure is exerted on the concrete. If your anchor is near the edge of the concrete it can “blow out” the side of the footing (exhibit C1).

Exhibit C1

Epoxy bolt installation does not exert any stress on the foundation, the compound bonds extremely well to the concrete and the bolt and hardens to strength equal to or greater than the concrete itself. An epoxy anchor can also be installed as close as 1¾” from the edge of the concrete. Because of the many variables in the condition of your foundation the use of the epoxy or chemical method is highly recommended.

(Exhibit C2): Cripple wall height is important, any shorter and the tools wouldn’t fit
Now you should be able to determine what kind of anchor you are going to use for the different sections of your foundation. If you can use anchor bolts and the mudsill is the same width as the framing, then label that section of your plan with 2A/S2, if the mudsill is wider than the framing then the use 2B/S2. If you are using the anchor plates then the reference will be 2C/S2. If you look at Figure 1/S1 you will see how these labels are put into your drawing.

![Figure 1/S1: Sample Foundation and Plywood Layout Plan](image)
D. Cripple Wall Bracing

Your home is extremely vulnerable to earthquake damage if it is supported by unbraced cripple walls. Cripple walls are usually constructed as wood framed stud walls with some sort of aesthetic exterior sheathing and possibly some lateral bracing. Older homes typically do not have enough cripple wall bracing. Without the proper wall bracing the cripple walls will not have adequate strength to resist earthquake forces and may collapse due to excessive side sway.

The plywood shear wall that is nailed to the cripple studs, mudsill and top plate creates a stiff panel that resists the side-sway forces. Plywood is a man made product that consists of thin sheets of wood layered with their grains perpendicular to the next layer and held together with glue. Planset A requires that a specific type of plywood be used for this purpose that has five alternating layers and is an exterior grade. When you go to the lumber yard you can ask for ½ inch structural 5-ply exterior grade plywood.

1. Application of Plywood

Detail 4/S2 on the planset shows how the plywood is attached to the cripple wall framing. If your mudsill is wider than your framing then you will need to add blocking at the bottom so that the plywood can have nailing all along the perimeter.
2. Why blocking is necessary for a mudsill that is wider than the cripple wall framing

Detail 4B/S2 gives the specifics for how the blocking is attached to the mudsill. New 2x blocking is to be installed between the cripple studs, nailed with (4) 10d common nails (.148” x 3”) per block, pre-drill and stagger nails.

- 2x blocking refers to lumber that is 2” in one direction and the other dimension should match the width of the cripple wall framing, i.e. if the wall is 2x4 then the blocking is 2x4
- 10d common refers to the size and type of nail, a 10d common nail has a diameter of .148” and is 3” long. They are labeled as such wherever you may buy nails.
- We suggest that you pre drill the blocks before you drive the nails, short blocks have a tendency to split. Staggering the nails also helps prevent splitting. Note, if you are using a pneumatic nailer it is not necessary to pre drill the blocks.

Detail 4/S2

Included in this detail are specifications for vent hole requirements in the plywood. Venting of the enclosed cripple wall ensures that moisture is not trapped in the wall which could result in decay. For a cripple wall 18” or shorter one 2 ½” or 3” vent hole is required, walls taller than 18” require two holes, one top and one bottom. These vent holes can easily be made with a hole saw which is a really just a large drill bit. These holes can be drilled either before or after the plywood is installed, if you drill them after the plywood is attached make sure to vacuum up the saw dust and wood pieces (termite food). Also included in this detail are specifications for attaching an additional 2x to an existing cripple wall stud. This will come in handy to provide the necessary edge nailing for the plywood. Your plywood should always over lap onto the framing ¾” minimum, if you find yourself in a position where this does not occur then you can “sister” on a piece of framing to ensure you get the proper nailing.
3. More notes on plywood installation

- Install plywood braced panels as close as possible to the ends of each wall line first. Panels may be located away from the ends of a wall line when existing obstructions or limited clearance necessitates such relocation.
- Plywood braced panels should be nearly equal in length and should be nearly equal in spacing along the length of the wall where possible.
- The length of each individual panel must be twice the height of the cripple wall being braced, but never less than 48 inches in length.
- The perimeter of all new plywood braced panels should be nailed to the existing cripple wall studs, top plate(s) and the mudsill at 4” on center (measuring from the center of one nail head to another). Attach plywood to the intermediate cripple wall studs at a maximum of 12” on center.
- Nails shall be 8d common x 2 ½” long with a minimum shank diameter of .131 inches (.131 x 2 1/2), .131 x 2 1/8’ nails may be used for installations using nail guns.
- Plywood braced panel shall be 5-ply, 15/32” exterior grade. 3 ply 15/32” plywood is not acceptable
- Maintain a minimum edge distance 3/8”, from the center of the nail to any plywood edge.
- Do not overdrive, countersink, or otherwise damage the “outermost ply” when installing nails.
- Do not space nails closer than 3 ½” in plywood braced panels.
- Nails must be firmly embedded in framing behind the plywood without causing splitting.

E. Floor to wall and floor to mudsill connections

In order to ensure an adequate connection between the cripple wall, the floors, the mudsill and the floor, Planset “A” requires the installation of metal framing clips at regular intervals along the perimeter of the under floor framing system. This connection is part of the load path chain. If the cripple wall is braced and attached to the foundation but is not attached to the floor of the house then the house can shift on top of the cripple wall. The installation for framing clips is essentially the same for houses with cripple walls and house with floor framing that sits right on the mudsill. In both cases a “L” shaped clip is connected to the rim joist, for cripple walls it is then nailed to the top plate, for non cripple walls it is nailed directly to the mudsill.
Detail 5/S2

Notice that the detail mentions L70, L90 clips and dH10 clips. The L70 and L90 clips are very similar and are different only in size and the number of nails used to attach them. The bigger clips with more nails may be spaced at wider intervals; the spacing requirements will be covered later when we get to the reinforcement schedule. The H10 clip is shown as an alternative to the “L” clips and is to be used only in instances where there is no physical way to nail the “L” clips into place. Later you can refer to the reinforcement schedule to see what type and size nails are required.
F. Typical Panel Cutouts and Notching Requirements

The under floor area of your house can have a variety of obstacles to be dealt with. Most houses will have under floor vents that will need to remain clear to allow proper ventilation. In the event a plywood panel must be installed where a vent is located you will need to make a cut out in the plywood. Studies have shown that a square hole in a piece of plywood can lead to failure under the stress of an earthquake; the plywood will actually tear at the sharp corner. It is therefore required that any hole cut into the shear wall have a rounded or radius corner. This can easily be done with a hole saw or a jigsaw. Before the plywood is installed at the vent location a piece of blocking should be installed to allow for proper edge nailing as shown in figure 3A/S2.

![Figure 3A/S2.](image)

The same method should be used for any other type of cutout such as to make room for a heating vent or for utilities such as water, sewer or plumbing. If just a notch needs to be cut, that too should be round. If there is a pipe or conduit that is notched into the framing make sure to put a “nail stop” over it. A nail stop is a piece metal hardware available at any lumber supplier that is installed over something you do not want penetrated with a nail.
G. Typical Top Plate Splice Details

A break in the top plate of the cripple wall weakens the structure and needs to be strengthened. If there is a double top plate and both of the plates are broken (discontinuous) and those breaks are within 48” of each other, a framing strap needs to be installed. Engineering calculations require that the strap used be 16 gauge (thickness) and wide enough that it can be nailed into both of the top plates and that there be no fewer than 14 nails installed on each side of the break. In cases where there is only a single top plate the strap can be narrower but must still be the same 16 gauge and have the same number of nails.

Summary
In the previous pages we have told you how to make the connections that are needed to create a load path. The next section will show you how to determine which details apply to your house and where to put them.
APPLICATION OF DETAILS TO YOUR HOME

A. Creating a plan for submittal

Which details, how many and where they go on your plan is determined by the Construction Data sheet and the Reinforcement Schedule, both found on page S1.

Section A is about the size of your house, you should have these measurements from your rough drawings.

Section B asks about the construction of your house, whether it is light or heavy. Light and heavy are defined in Detail 4/S1 which states that a home that has an exterior finish made of stucco or has standard weight concrete tile (greater than 11lbs/sq.ft.) on the roof is considered heavy construction. A house with wood siding and a composition or metal roof would be considered light.

**Note:** there are numerous light weight concrete tile roofing products available and if the weight of the tile is less than 1lbs/sq.ft. it is considered light.

Once you know the square footage and weight of construction of your house refer to the reinforcement schedule to see what the anchorage requirements are for your house.

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**CONSTRUCTION DATA**

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**GENERAL HOME INFORMATION:**

A. **Square footage calculation**

1. No. of stories above criplate wall/mud sill: __________ sf (Do not include areas above garage slab)
2. Approximate 1st floor area over crawl space: __________ sf
3. Approximate 2nd floor area over crawl space: __________ sf (Do not include areas above garage slab)
4. Total floor area: __________ sf

B. Is your home of "Light" or "Heavy" construction?

1. See detail 4/S1 for definition of heavy versus light construction
2. □ HEAVY construction  □ LIGHT construction

**FLOOR FRAMING CONNECTION:**

□ FRAMING CLIP: __________

Manufactured by __________

Part No. __________

Load value parallel to criplate and/or mud sill __________

**MUDSILL ANCHORAGE:**

EXISTING

□ BILTS: Diameter __________ Spacing __________

NEW

□ BILTS: Diameter __________ Spacing __________

□ Type: □ Concrete □ Expansion/Mechanical

□ ANCHOR PLATE: Manufacturer __________

Part No. __________

□ Type: □ Concrete □ Expansion/Mechanical

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**REINFORCEMENT SCHEDULE**

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**GENERAL INFORMATION**

**PLYWOOD BRACING**

**MINIMUM TOTAL BRACING LENGTH ALONG EACH WALL LINE**

**MINIMUM SILL ANCHORS ALONG EACH WALL LINE**

**MIN. NO. OF FLOOR FRAMING CLIPS (1FC) X 3**

**MN. NO. OF CRIPPLE WALL / MUDSILL CONNECTION**

<table>
<thead>
<tr>
<th>CHECK THE BOX WHICH APPLIES TO YOUR HOME</th>
<th>1- &amp; 2-STORY REQUIREMENTS</th>
<th>1- &amp; 2-STORY REQUIREMENTS</th>
<th>1- &amp; 2-STORY REQUIREMENTS</th>
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**UP TO 2 BOLTS**

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<tr>
<th>1/2&quot; BOLT</th>
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<th>NO. OF CRIPPLE WALL / MUDSILL CONNECTION</th>
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<td>5</td>
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**Detail 4 S/1**
Example:
A 2200 sq.ft. house with two stories and a stucco finish.
Since there is not a line with 2200 sq.ft.; you would need to go to the next higher line which is 2400, there are two choices, light or heavy, in this case choose heavy, look to the right to see what the requirements are (see below)

<table>
<thead>
<tr>
<th>GENERAL INFORMATION</th>
<th>PLYWOOD BRACING</th>
<th>MUDSILL ANCHORAGE</th>
<th>FLOOR TO CRIPPLE WALL / MUDSILL CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL FLOOR AREA (sq ft)</td>
<td>HEAVY OR LIGHT CONSTRUCTION</td>
<td>MINIMUM TOTAL BRACING LENGTH ALONG EACH WALL LINE</td>
<td>MINIMUM SILL ANCHORS ALONG EACH WALL LINE</td>
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<tr>
<td>2400</td>
<td>Heavy</td>
<td>29'-4&quot;</td>
<td>UFP10 (2)</td>
</tr>
</tbody>
</table>

- The total amount of plywood bracing that needs to be installed on each wall line is 29'4".
- The anchorage to the mudsill can be either (9) UFP10 plates or (14) ½” diameter bolts or (10) 5/8” diameter bolts.
- The number of floor to cripple wall/ mudsill connections can be either (25) L70’s, (19) L90’s or (19) H10’s.

*Note: all of these quantities are the minimum number required*
1. About the footnotes (Detail 4 S/1):

The reinforcement table has a number of footnotes that provide important details:

1. Tells you that the square footage of your house should be in the Construction Data (detail 5).
2. Explains that if you must mix the type of anchor, bolts and UFPs on any given wall that a UFP counts as one bolt.
3. If you have floor joists that are 16” on center you should have one only one “L” bracket per bay (space between two joists). If the joists are spaced at 24” o/c then it is permissible to put two “L” brackets per bay.
4. The nails used to install the “L” brackets are to be 10d x 1 ½”, these are also called #10 TECO, or joist hanger nails. (.148 dia x 1 ½”)
5. The nails used to install the H10 brackets are to be 8d x 1 ½”, these are also called #8 TECO, or joist hanger nails. (.131 dia x 1 ½”)
6. States that the H10 should only be used as a substitute where the “L” bracket is impossible to nail.

Also included in the reinforcement detail section is a connector capacity chart which tells you what the designed capacity is for the bracket that you choose to use. You will need this information to fill in the Construction Data in Detail 5. Remember that if you use an alternate bracket you must provide the manufacturers data sheet and submit that with your plan when you apply for your permit.
COMPLETING YOUR PLANSET AND OBTAINING A PERMIT

If you have not already transferred your drawing to the planset you should do so now. It is essential that you fill in all of the detail notations for each wall line. Use the sample Foundation and Plywood Layout on page S1 as a guide. Check the shaded portions of S1, all the information should be filled in and the boxes checked. When you go to the building department to submit your planset they are going to ask you for two copies so be prepared. The building department will keep one copy for their records and give you back a stamped “job site copy”. Depending on the work load of the plan checkers your permit may be approved over the counter (same day) or may need to be submitted for further plan check. Once the plan check process is complete you will be asked to pay the fee and your plans will be stamped and returned to you along with a job card. You will need to have the stamped set of plans and the job card on site for all of your inspections.

Applying for a permit may be a new experience for some, the more complete your submittal is, the easier the process will be. Only the homeowner or a licensed contractor may take out a permit. If you don't have the proper license or your name is not on the title you will not be allowed to pull a permit. Permit costs vary from city to city, you can call ahead to see what the ballpark price is going to be. Be prepared, they may ask you for the valuation of the project which must include the cost of materials and labor (even if you are doing the work yourself).

*Note: if you discover additional work that needs to be done you will need to obtain a separate permit for that work.

Pre-Construction Inspection

Once you have obtained your permit, at your request, an inspector will perform a preconstruction inspection of the under floor area of your house. Any issues or problem areas that you may have questions about can be addressed at this time. If you are using epoxy anchors this is a good time to show how you prepare the holes and install the epoxy and bolts.
**What inspections are required?**

- Installation of the foundation bolts and or foundation plates
- Installation of blocking, (do not conceal the blocking with plywood panels until approved)
- Installation of plywood shear panels on cripple walls
- Installation of metal framing clips
- Final inspection

These inspections can be doubled up, for instance you can have the inspector look at the shear ply, the clips and the final at the same time if you are ready for that.

The building inspector can be an excellent resource for information. Please be mindful of their time as they typically have a busy schedule. Write down your questions and use the time he or she has constructively. If you find yourself confronted with a problem you cannot solve call and ask a question before you proceed. If you move forward and it is not done right you will not pass your inspection.

Good luck with your retro fit, take your time and you will be rewarded with the peace of mind that comes with a job well done!
### Home Seismic Checklist

[Check all of the conditions listed below that apply to your house and fill in all pertinent information.]

#### FOUNDATION CONDITIONS

- Continuous concrete foundation
- Perimeter foundation system that is **not** continuous
- Masonry, brick or stone foundation system
- Stepped foundation
- Other:
- Deteriorated, cracked or soft concrete
- Differential settlement of portions of foundation
- Rolled, tilted or displaced footings or foundation walls
- Capped foundation

#### EXISTING MUD SILL BOLTING & SPACING

- No bolts (☐ randomly spaced bolts)
- Bolts spaced more than 6 feet on center
- Bolts not located within 12 inches of the ends of each piece of mud sill plate
- Deteriorated, severely rusted or damaged bolts
- Bolts with incomplete hardware
- Other:

#### CRIPPLE WALL & MUD SILL CONSTRUCTION

- No mud sill
- No cripple wall top plate(s)
- Rim joist rests on top of cripple studs
- Lack of continuous rim joist
- Lack of blocking between floor joists
- Other:
- Mud sill wood type:
- Mud sill width:
- Mud sill offset from interior foundation edge ___________ inches.
- Maximum cripple wall height:

#### MISCELLANEOUS

- Chimney construction breaks continuity of foundation or cripple wall
- Under-floor access openings break continuity of cripple wall
- Other:
- Number of stories above cripple wall:
- Type of roof covering:
- Exterior brick veneer - maximum height above foundation:
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# FULL SCALE NAIL CHART

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SPECIAL CONDITION - 1

LACK OF BLOCKING ABOVE CRIPPLE WALL AT CANTILEVERED FLOOR

NO FRAMING ELEMENTS ON WHICH TO INSTALL FRAMING CLIPS

Framing modifications are necessary to provide the required nailing surfaces for the framing clips and to ensure connections which complete the load path between the cripple wall and the floor system.
REPAIR DETAIL – 1A

REPAIR DETAIL FOR CANTILEVERED FLOOR WITH NO BLOCKING ABOVE CIRPPLE WALL
(Install solid blocking between joists - "METHOD 1"
or
install continuous 2x member - "METHOD 2")
SIDE VIEW
Cantilever Above Cripple Wall

REPAIR DETAIL – 1B

REPAIR DETAIL FOR CANTILEVERED FLOOR WITH NO BLOCKING ABOVE CRIPPLE WALL
(Install solid blocking between joists - “METHOD 1"
or
install continuous 2x member - “METHOD 2”)
REPAIR DETAIL – 1C

REPAIR DETAIL FOR CANTILEVERED FLOOR WITH NO BLOCKING ABOVE MUD SILL
(Install solid blocking between joists - “METHOD 1”)
REPAIR CONDITION #2

NO CRIPPLE WALL TOP PLATE(S)

RIM JOIST RESTS ON TOP OF CRIPPLE STUDS

Framing modifications are necessary to provide the required nailing surfaces for the plywood shear panels and to ensure connections which complete the load path between the cripple wall and the floor system.
REPAIR DETAIL – 2A

REPAIR DETAIL FOR CRIPPLE WALLS WITH NO TOP PLATE(S) WHERE THE RIM JOIST RESTS DIRECTLY ON THE CRIPPLE STUDS
REPAIR DETAIL FOR CRIPPLE WALLS WITH NO TOP PLATE(S) WHERE THE RIM JOIST RESTS DIRECTLY ON THE CRIPPLE STUDS
REPAIR DETAIL WHERE INADEQUATE SPACE BETWEEN THE RIM JOIST & ADJOINING FLOOR JOIST PREVENTS INSTALLATION OF FRAMING CLIPS AND/OR MUD SILL ANCHORS

CUT AWAY ENOUGH OF THE EXISTING JOIST TO ALLOW FOR HARDWARE INSTALLATION (AVOID DAMAGING THE EXISTING SUBFLOOR NAILING). INSTALL REQUIRED CLIPS & HARDWARE, THEN INSTALL IDENTICAL NEW JOIST ALONGSIDE THE CUT AWAY JOIST.

8d COMMON NAIL @ 4" O.C., FASTENED @ PANEL EDGES

NEW JOIST SIZE & BEARING POINTS TO MATCH THAT OF THE OLD JOIST. INSTALL WITH CROWN UP TO PROVIDE SUPPORT FOR SUB-FLOORING.

PLYWOOD SHEAR PANEL

SIDE VIEW
TOOL CHECKLIST

☐ Hammer/Drill (rotohammer) and associated bits
☐ Regular drill (1/2” chuck)
☐ Hole saw 2 ½”-3”
☐ Large Crescent wrench
☐ Epoxy dispensing gun
☐ Epoxy
☐ Compressor
☐ Air hose
☐ Framing nail gun
☐ Sense of humor
☐ Palm nailer
☐ Circular saw
☐ Hand tools
☐ Hammer,
☐ Punch,
☐ Nail puller,
☐ Tape measure
☐ Paper and pencil
☐ Chalk line
☐ Flashlight

MATERIALS

☐ 5 ply structural exterior grade plywood
☐ 8d common nails for plywood nailing minimum .131”x 2 ¼
  ○ (use “10d shorts for the nail guns”)
☐ 10d x 1 ½” nails for “L” clips
☐ 8d x 1 ½” for H10 clips
☐ Epoxy
☐ Anchors